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AN ANALYTICAL CORE FOR SOCIOLOGY: A COMPLEX, HAYEKIAN ANALYSIS

Paul Lewis
Department of Political Economy
King's College London

paul.lewis@kcl.ac.uk

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1. INTRODUCTION

My goal in this paper is to elaborate on a facet of Gintis and Helbing's¹ 'analytical core for sociology' that they mention in their paper but which they do not discuss in detail, namely its portrayal of the economy as a complex adaptive system. In doing so, I hope to highlight features of GH's approach that are likely to be of particular interest for what I take to be their intended audience, namely sociologists. Many, though not of course all, sociologists have been sceptical about the merits of 'imperialist incursions' by economists into areas that have traditionally been regarded as the terrain of sociology. In particular, sociologists have tended to baulk at what they see as the illegitimate reductionism typical of much economic analysis, which - by trying to explain social phenomena solely in terms of the narrowly self-interested decisions of isolated, atomistic economic agents - fails to justice to the social embeddedness of, and the variegated motivations for, human conduct (see, for example, Granovetter 1985, Etzioni 1988; Emirbayer 1997). However, as I shall argue, the features of GH's analytical framework that stem from, and together help to comprise, its account of the economy as a complex adaptive system - such as its emphasis on group selection, on the social relations that structure people's interactions, and the importance of motivations stemming from so-called 'social preferences' - distinguish their approach from that adopted in much of economics and should help to make their analytical framework rather more - if not, perhaps, entirely - palatable to sociologists.

There is now a long history of complexity theorising in economics. One of the earliest thinkers to develop a complexity perspective on the economy was the Austrian Nobel Laureate Friedrich Hayek, who became increasingly interested in complexity theory from the early 1950s (Caldwell 2004: 297-310). In considering the implications of GH's commitment to a complex systems approach, I shall use Hayek's writings to provide illustrative examples of what that approach might involve. As we shall see, Hayek's work in the field of complexity economics provides a fruitful point of comparison that can be used to bring certain features of GH's approach into sharper focus and to clarify their significance.

¹ Hereafter referred to as GH. All otherwise unattributed references in the remainder of this essay will be to GH's paper.

The structure of the paper is as follows. Section 2 outlines the nature of complex systems and provides an account of one example of complex system analysis, namely that provided by Hayek's theory of market order, highlighting the importance of emergent properties and the anti-reductionist implications of complexity theory. Section 3 develops these points by highlighting how theories of group selection, of the kind espoused both by GH and by Hayek, can be used to provide a dynamic analysis of emergence and how, in doing so such approaches depart from methodological individualism (as that term is commonly understood). Section 4 shifts focus from the level of the group to that of the person, considering a portrayal of the human mind as a complex system and exploring in the light various aspects of human agency such as the possibility of pro-social behaviour. Section 5 also highlights some of the potential implications of a complex systems perspective, both for the degree of uncertainty faced by economic actors and also for how the order exhibited by such systems should be understood. Section 6 summarises and draws conclusions.

2. COMPLEX SYSTEMS, EMERGENCE, AND THE IRREDUCIBILITY OF SOCIAL LAWS

2.1 The Nature of Complex Systems

A complex system – more specifically, one that displays organised complexity – has the following attributes. First it is composed of a set of elements which are related to – and so interact with – one another in a particular way. Second, it exhibits properties which are different from those of its parts taken in isolation. Third, these properties are often novel in the sense that it is hard, if not impossible, to predict them from our prior knowledge of the elements. Fourth, it is adaptive in the sense that it adjusts to the broader environment in which it is situated via an evolutionary process involving variation, selection, and (differential rates of) reproduction (Hayek [1964] 1967; Page 2011: 24-33). In this section of the paper, we shall focus on the first two properties. We shall return to the third and fourth properties in sections 4 and 3 respectively.

Consider, then, the first two attributes of complex systems. The set of relations that must obtain between a set of elements if they are to constitute a particular kind of complex system is known as the system's *structure*. The properties that obtain when the elements or parts are related in the requisite way are known as *emergent properties*. Emergent properties are structural in the sense that their existence depends not only on the presence of their ('lower-level') constituent parts but also on those parts being organised into a particular (emergent or 'higher-level') entity that involves them standing in certain relations to one another and interacting with each other in a structured fashion. The notion of emergence suggests, therefore, that reality consists of a hierarchy of ontologically distinct levels, ranging from the physical through the chemical and biological to the mental, individual and social. The existence of the higher-level entities is contingent upon their constituent and lower-level components. But the higher-level

entities possess emergent properties that arise only as a result of the relations obtaining between their lower-level parts and that are distinct from the properties of those lower-level entities taken in isolation. According to complexity theory, therefore, the world consists of a hierarchy of nested systems, with smaller systems existing within the context of larger ones in a hierarchy of levels of organisation (Miller and Page 2007: 41-45, 50-51; Jepperson and Meyer 2011: 60-61).

GH characterise the social world as a complex system. They argue first of all that ‘human society has the key characteristics of a complex dynamical system: it consists of many structural similar, strongly interacting and intricately networked units (social actors)’. In keeping with the first attribute of a complex system listed above, GH view society as consisting of a set of elements, namely people, whose interactions with each other are structured by the ‘set[s] of rights, duties, expectations, material and symbolic rewards, and behavioural norms’ associated with the various roles they occupy. Second, the whole that is formed when people’s interactions are structured in this way ‘exhibit[s] emergent properties at the macro-system level’, thereby displaying the second key feature of a complex system.

2.2. An Example of the Economic Analysis of Complex Systems: Hayek’s Theory of Social Order

To see in more detail what a complex systems perspective on socio-economic life might involve, consider Hayek’s account of the market economy. For Hayek, market economies display all hallmarks of such a complex system. They are composed of a set of elements, in this case people, the relations between whom take a particular form. More specifically, on Hayek’s account, a market system arises when the relations between people who interact on competitive markets are governed by a set of rules that includes both the formal legal rules of contract, property and tort law, and also informal moral rules of honesty and promise-keeping. Those rules define various positions (e.g. buyers and sellers, employers and employees, creditors and debtors) and set out the rights their occupants enjoy and the obligations they bear. These are, of course, examples of the social roles or positions to which GH refer. The rules specify in broad terms how the occupants of those positions must relate to one another (e.g. legally binding employment contracts specify the rights and responsibilities of employers and employees, detailing for example both what an employer must pay his/her employee and also what the employer can expect from the employee in return). In this way, the rules in question define the relations between those positions, specifying in broad terms how people should relate to one another in order to form a working market system. And, as GH note, the social rules associated with those positions help people to coordinate their plans. For it is people’s knowledge of the legal system, and of the rights and obligations that take upon themselves when they enter into legally binding

contracts, and of moral norms and rules, that plays a crucial role in facilitating the formation of mutually compatible plans (Hayek 1973: 106-09, 172 n. 25).²

Second, and relatedly, the market system exhibits properties which are different from those of its parts taken in isolation. In particular, it displays the emergent property of being able to coordinate people's plans, even when those plans are developed independently by individuals in the light of their own particular ('local') knowledge. What Hayek shows is that, once the interaction of people on competitive markets is structured by an appropriate set of rules, a configuration of relative prices is generated that – when taken in conjunction with the background information provided by social rules – enables people to adjust their plans to one another well enough for them to have a decent chance of coming to fruition (that is, for social order to obtain). The coordinative power in question, which Hayek ([1967] 1967: 68, 70) refers to as 'the overall order of actions', is an emergent property because it is possessed only by a particular whole – namely the free market system that is constituted by a group of people whose interactions are structured by a set of rules that includes the formal rules of contract, tort and property law, along with informal norms of trust and promise-keeping – and not by those individuals taken in isolation. It is 'more than the totality of regularities observable in the actions of the individuals and cannot be reduced to them ... It is more than the mere sum of its parts but presupposes also that those elements are related to each other in a particular manner' (Hayek [1967] 1967: 70).³

2.3 Beyond Reductionism

GH's claim that such emergent properties 'resist analytical derivation from the behaviour of the individual parts' requires a little unpacking. The point is that, because the existence of emergent entities – and their emergent properties, including causal powers⁴ – depends not only on the presence of particular elements but also on their standing in certain relations to one another, such entities and properties are ontologically and causally irreducible to the properties of their parts and so cannot be entirely eliminated from causal explanations of events in the real world (such as, in the case of Hayek, the generation of relatively orderly outcomes in markets). The reason is that, if the parts in question were not so organised, then the causal influence that depends upon the parts being arranged in that particular way would not arise. The causal power is a *sui generis* property of the relational organisation of the parts when they form that emergent entity, not of

² Compare GH, who write that 'the complex of social norms has an *instrumental* character ... serving as an informational device that coordinates the behaviour of rational agents' with Hayek's remark that legal rules 'could almost be described as a kind of instrument of production, helping people to predict the behaviour of those with whom they must collaborate' (Hayek [1944] 2007: 113).

³ Durkheim, upon whose notion of collective consciousness GH draw, can also be read as a proto-emergentist, with his notions of 'social facts' and 'collective representations' arguably being best understood as emergent social phenomena (Sawyer 2002).

⁴ A causal power is a capacity to behave in a particular way, to bring about a particular kind of effect, and thereby to make a difference to the course of events in the real world. Examples of causal powers include water's capacity to extinguish fires and the capacity of societies where production is organised under the division of labour to produce higher levels of output than ones not so characterised. An emergent entity possesses causal powers because the elements of which it is composed are arranged so as to constitute a mechanism – a way of acting or working of a structured entity – that produces the power in question.

the individual parts taken either in isolation or as an unstructured aggregate. For instance, the causal power to extinguish fires and to slake one's thirst is a property of an emergent entity, namely water, not of the individual hydrogen or oxygen atoms of which water is composed. Causal explanations of how fires can be extinguished or thirst quenched must therefore make reference, if only implicitly, to that emergent entity and its emergent causal powers, because it is only when hydrogen and oxygen atoms are arranged into the form of water that the relevant causal power is present (Elder-Vass 2007a: 30-3; Jepperson and Meyer 2011: 68-69; Lawson 2012: 352).

This suggests that attempts to understand a complex system such as the economy by reducing it to its isolated, constituent parts – in the case of economics, by reducing it to the actions of isolated, atomistic 'economic men' – are doomed to failure. It is also necessary to know about the relations governing how the parts interact with each other (Hayek 1952a: 67, 145-46; Miller and Page 2007: 10, 27, 66-67). As Hayek puts it, in the case of the relationally-defined whole that is the market system, the set of rules that structures people's interactions in the market constitutes 'a constant structural element [in society] which can be separated and studied in isolation' (1952a: 59). For Hayek, therefore, as for GH, reductionism is not feasible and the rule-governed, relationally-defined social wholes that structure people's interactions are causally efficacious, explanatorily irreducible factors in their own right (Hayek [1964] 1967: 39) (cf. Gintis and Bowles 2014).

An emergentist perspective suggests, therefore, that, just as one cannot deduce people's behaviour simply from a knowledge of human biology, so too is it impossible to explain sociological phenomena solely in terms of the behaviour of (isolated, atomistic) individual people (or even, in more extreme cases of reductionism, in terms of micro-physical particles). The ontological, causal, and explanatory irreducibility of emergent properties, coupled with the picture of the world as a hierarchy of levels of organisation, is important because it leaves a distinctive role for different disciplines, each of which studies the emergent entities – and associated 'laws' – at a particular level in the hierarchy. On this view, the analytical framework proposed by GH is devoted to uncovering the social laws that express the explanatory significance of the relations obtaining between people and the mechanisms through which their interaction causes certain kinds of social phenomena (Jepperson and Meyer 2011: 60-61, 61-66).⁵

This emphasis on the ontological, causal and explanatory irreducibility of emergent properties and social laws might sit uneasily with the usual descriptions of economists – such as Hayek and GH – as methodological individualists, with all the reductionist connotations that usually accompany that term. However, Hayek's and – as we shall see – GH's version of methodological individualism is very different from that propounded by standard economics. In each case, there are two key points of departure from methodological individualism, as that term is normally understood, both of which arguably reflect the complexity perspective to which Hayek and GH subscribe: the first is the possibility of group selection; while the second is a

⁵ A key issue concerns what is meant by the term 'law' in this context. For one possible answer, see Lewis (2011: sections 3-4, 2013: 395-401).

willingness to move beyond portrayals of people as isolated, self-interested atoms to consider how people's dispositions and preferences can be shaped by the social context in which they are situated. We shall examine each of the deviations from standard economics, both of which ought to make the complexity approach adopted by Hayek and GH more palatable to sociologists, in the next two sections of the paper.

3. THE DYNAMIC ANALYSIS OF EMERGENT PROPERTIES: GROUP SELECTION AND CULTURAL EVOLUTION

3.1 The Diachronic Analysis of Emergent Properties: Hayek's Theory of Group Selection

For Hayek, the coordinative powers of the price mechanism are an emergent property of the rule-governed interactions that take place between people in free markets. Hayek explains the origins of those rules by developing an evolutionary account whereby the set of rules in question is the product of a process of competition between groups of people, where the groups in question are defined by reference to their allegiance to different sets of rules. '[W]hat may be called the natural *selection* of rules will operate on the basis of the greater or lesser efficiency of the resulting *order of the group*', Hayek ([1967] 1967: 67) writes, continuing that: 'It is the resulting overall order of actions but not the regularity of the actions of the separate individuals as such which is important for the preservation of the group ... [S]ystems of rules of conduct will develop as wholes' ([1967] 1967: 68, 71). As the quotation suggests, the attribute that forms the basis for the selection of groups is the emergent property known as the overall order of actions. It is in virtue of their capacity to generate that emergent causal power that groups – and, more specifically, the sets of rules that characterise them – are selected (or not, as the case may be) in the process of social evolution and so prosper and grow.⁶

In this way, Hayek's account of cultural evolution provides the dynamic counterpart of his static or synchronic explanation of how, by acting in accordance with a given set of rules, people's behaviour on markets gives rise to the emergent power to coordinate people's actions, providing a diachronic analysis of how the relevant set of rules comes into being in the first place. Here we see how Hayek's account of how the market economy displays the fourth feature of a complex system identified in Section 2 above, namely that such a system should be adaptive in the sense that it adjusts to the broader environment in which it is situated via an evolutionary process involving variation, selection, and (differential rates of) reproduction.

For the purposes of comparison with GH, it is worth elaborating on how variety is introduced into this evolutionary process and also on how successful groups pass on their attributes. The discussion of variety will be postponed until section 4 below. Here, we shall

⁶ More specifically, for Hayek, groups prosper or wither away according to their ability to generate the wealth required to sustain higher populations (Hayek 1988: 6, 43, 120-22). The mechanisms through which group selection takes place include birth rates, immigration, conquest, and imitation (Hayek 1960: 59, 1979: 159-60) (cf. Gintis and Bowles 2014).

consider the process of replication. The replicator in Hayek's evolutionary account is provided by the set - or, as GH put it, 'the complex' - of formal and informal rules to which the relevant group adheres, not the individual rules taken in isolation. In other words, the emergent property upon which group selection acts is the outcome of the interaction of several different rules rather than being simply the aggregation of their separate effects. Hence Hayek's remark that, '[S]ystems of rules of conduct will develop as wholes' ([1967] 1967: 71). For example, on Hayek's account, the existence of formal legal rules is insufficient to generate the emergent causal power to coordinate people's actions; informal moral rules of promise-keeping and truth-telling are needed as well (Hayek 1960: 36, 158, 1984: 321-22).⁷ And while Hayek notes that there is a sense in which these rules are instrumental, because adherence to them furthers the achievement of other goals, he also - like GH - argues that 'since we only rarely can know what depends on their being followed in the particular instance, to observe them must be regarded as a value in itself, a sort of intermediate end which we must pursue without questioning its justification in the particular case' (Hayek 1960: 67; also see Hayek 1960: 62-63, 93 and 1976: 11-17).

The process of replication through which the set of rules that underpins the superior performance of successful groups is passed from one generation of group members to the next is Lamarckian, resting on the inheritance of acquired characteristics. The learning in question occurs principally via imitation, whether it be through children imitating their parents or adults imitating their peers or elders who have achieved success and prestige (Hayek [1967] 1967: 66, 78, 1988: 21, 25). Like GH, therefore, Hayek views the development of society as involving a process account of cultural evolution resting on an epigenetic transmission mechanism.

It is worth observing that, for all his emphasis on the group selection of sets of rules, Hayek also acknowledges the possibility of the direct selection of individual rules. Hayek readily admits that individual people can deviate from traditional rules and experiment with new forms of behaviour, thereby injecting novel variations into human conduct that might, if imitated by sufficient numbers of their fellows, coalesce into new rules (Hayek 1979: 161, 167). As GH put it, 'Homo sapiens is not only Homo socialis, but also *Homo ludens*: our species has the capacity to construct novel games with great flexibility'.⁸ Such behaviour involves individual people making a conscious decision to adopt a new rule or practice in the light of their subjective assessment of the merits of doing so. In contrast to group-level processes, therefore, where rules are selected on the basis of their capacity to contribute to a wider set of rules that generates an overall order of actions, lower-level selection involves rules being chosen on the basis of their appeal to individual people. As GH put it, 'conflicting social norms ... vie for dominance, and cultural dynamics are often the result of these conflicts'. The overall picture that emerges from Hayek's writings on cultural selection, then, is one of a multi-level evolutionary process in which rules are subject to selective pressure both from 'above', as complexes of rules

⁷ '[F]reedom has never worked without deeply ingrained moral beliefs and ... coercion can be reduced to a minimum only where individuals can be expected as a rule to conform voluntarily to certain principles' (Hayek 1960: 62).

⁸ For a fascinating analysis of how people are able to develop new systems of rules for governing their interactions, see Ostrom (1990).

compete in the higher-level process of group competition, and also from ‘below’, as individual rules are selected in virtue of their ability to command the allegiance of individual people (Hayek 1988: 23-24; also see Wilson 2004).⁹

3.2 Implications: Anti-reductionism and Departures from Methodological Individualism

The significance of this for our present purposes is twofold. First, the emphasis on group selection marks a significant departure from the reductionist version of methodological individualism to which most economists subscribe (see, for example, Vanberg 1986). If Hayek’s account of cultural evolution provides a reasonable illustration of the kind of theory that GH’s complexity perspective might sustain, then it helps us to see that when GH refer to ‘the complex of social norms’ they are referring to a set of rules that is not simply – as conventional game theory would suggest – the (Nash equilibrium) outcome of the strategic decisions made by asocial, amoral economic men. On the contrary, the configuration of rules in question is the outcome of a multi-level evolutionary process, involving – as we have seen – not just the direct selection of rules via the (lower-level) choices made by individual people) but also the indirect selection of sets of rules via a (higher-level) process of group selection centering on the capacity of those rules to generate the emergent causal power to coordinate people’s actions. Hence GH’s emphasis on cultural evolution and, in particular, their remark that, in their evolutionary model, ‘culture, like genes, [can] evolve through replication (intergenerational transmission), mutation and selection’.

Second, the fact that the sets of rules in question include both social and moral rules raises the question of kinds of motivation that can be included within GH’s and Hayek’s accounts of individual conduct. In contrast to the asocial, amoral nature of *homo economicus*, the preferences and motivations that drive GH’s *homo socialis* are, like those assumed by Hayek, profoundly shaped by the social and moral rules that govern the society in which they are situated, and can give rise to patterns of behaviour that involve people departing from the pursuit of their own material self-interest. This willingness both to consider a broader variety of motivations, and also to analyse the processes through which people’s dispositions and preferences are shaped by the social context they inhabit, marks a significant points of departure from standard economics. We shall elaborate on these points in the next section of the paper, when we consider the model of human agency to which GH and Hayek subscribe.

4. ASPECTS OF HUMAN AGENCY: RATIONAL CHOICE THEORY, SOCIAL PREFERENCES, RADICAL UNCERTAINTY, AND HAYEK’S *THE SENSORY ORDER*

4.1 Rational Choice Theory and Social Preferences

⁹ For a fascinating example of multi-level explanation from sociology, see Jepperson and Meyer (2011).

GH subscribe to a model of rational choice that portrays people as having (i) a set of beliefs - couched in terms of subjective probabilities - about the various possible outcomes to which their actions might lead, and (ii) a set of (consistent) preferences that enables them to evaluate those outcomes. The model is one in which people can be represented as having a von-Neumann-Morgenstern utility function defined over the set of consequences of their actions. If a person is rational, then (s)he can be represented as if (s)he chooses a course of action that maximises his/her expected utility, subject to the constraint imposed upon her by his/her income, etc. The outcomes in question are broadly defined so as to encompass not only the material well-being of the individual in question but also (a) aspects of the person's actions that are deemed to be intrinsically valuable (e.g. whether those actions conform to generally accepted norms of honesty, trustworthiness, etc.) and (b) the welfare of other people (i.e. people's preferences can be other-regarding). Where GH depart from the usual accounts of choice under uncertainty, therefore, lies principally in their assumptions about the breadth of people's concerns, with GH's assuming that they have a 'concern for social life in the broadest sense'. For GH, people's preferences are not merely *self*-regarding; they also include *other*-regarding and *ethical* preferences (the latter two varieties being known collectively as *social preferences*) (cf. Gintis and Bowles 2014).

Significantly, GH note that the rational choice theory (RCT) '*expresses but does not explain individual preferences.*' In other words, RCT draws out the implications for people's choices of a *given* set of preferences but it typically does not investigate the social and psychological processes through which those preferences come to be as they are. The complexity perspective developed by GH departs from this feature of standard RCT by analyzing the processes through which people's preferences are shaped by the social context they inhabit. We can elaborate on the kinds of neural mechanisms involved in this process by examining briefly Hayek's work on theoretical psychology, as set out in his 1952 book *The Sensory Order* (Hayek 1952b). Doing so will enable us to once again to elaborate on the kind of analysis that can be sustained by complex systems theory.

4.2 The Mind as a Complex System: Hayek's Theoretical Psychology

While considerations of space do not permit a detailed exposition of Hayek's work on theoretical psychology, the key features are as follows.¹⁰ For Hayek, the mind consists of a hierarchy of interconnected nerve fibres, which acts as a rule-governed system of classification that discriminates between different physical stimuli in such a way as to give rise to the pattern of sensations – the sensory order, as Hayek terms it – that people actually experience. For Hayek, the unique causal powers of human mind, including not only its ability to generate the phenomenal world of sense experience but also its capacity to imbue events with meaning and to

¹⁰ For a fuller account, see Lewis (2012: 370-73).

initiate courses of actions in a purposeful fashion, are all possessed only by a particular whole – namely the hierarchically ordered arrangement of neurons found in the human brain – and not by those neurons taken either in isolation or as an unstructured aggregate. Hayek’s theory of the mind is relational, therefore, in the sense that it is the structure of the connections between neurons that underpins and accounts for the operation of the mind. On Hayek’s view, the characteristic features of human agency are emergent properties of the structured arrangement of neurons found in the human brain and central nervous system. Put slightly differently, people have properties – perhaps most notably, the capacity to engage in purposeful action – that are emergent from, and irreducible to, their lower-level biological components.

For Hayek, the neural structures found in the human brain create in people dispositions both to perceive certain classes of external stimuli as constituting particular types of situation, and also ultimately to respond to those circumstances in certain ways (Hayek 1952b: 79-96, 112-27). On this view, the brain is – as GH put it – a mechanism ‘for transforming sensory inputs into decision outputs’. It is also worth noting in this context that, for Hayek, the mind develops via an evolutionary process of selection through which neural structures are reinforced, or wither, according to how successful they are in promoting behaviour that is well adapted to the prevailing context and which therefore enables a person to succeed in his or her goals. Configurations of neurons are selected in virtue of their emergent capacity to classify the world in a way that enables the individual to navigate successfully his/her environment (Hayek 1952b: 74). This process of neuronal group selection on the basis of the emergent properties of the group as a whole is, of course, analogous to the process of group selection that Hayek believes accounts for the development of rule-governed social systems such as the market economy. For Hayek, therefore, the mind is itself a complex adaptive system (McQuade and Butos 2005).

If it is indeed the case that the social world is layered or stratified, consisting – for example – of both people and social groups, each of which possessing its own distinctive and irreducible causal powers, the question arises of the interaction between entities at different levels.¹¹ What is especially interesting about Hayek’s account for the purposes of comparing and contrasting it with GHs’ analytical core for sociology is the way in which Hayek’s theory implies that the social rules which are the building blocks of higher-level entities such as the market system can shape the people’s dispositions and thus influence the way in which people act (i.e. they can influence the human agency exercised by those people). Roughly speaking, the point is that repeated action in conformity with a social rule can – via social-psychological processes of habituation, imitation, conformism, and so forth – cause neurological changes that lead to the formation of new neural structures and, therefore, to people having new dispositions to conceptualise and respond to their circumstances in certain ways. To see why, consider from the vantage point provided by Hayek’s theory of the mind the kind of example mentioned by GH, namely the way in which someone who has just come to occupy a new role – such as a teacher or

¹¹ Hence Hayek’s remark that, ‘Societies differ from simpler complex structures by the fact that their elements are themselves complex structures’ ([1967] 1967] 76).

a shop assistant - learns how to behave in accordance with the rules and norms associated with that new position. Those rules and norms specify the rights and obligations of people who occupy the roles in question, setting out the modes of address and conduct that should be used when interacting with pupils or customers. New teachers and sales assistants have to learn the appropriate behaviour consciously, typically under the instruction of an instructor or more experienced colleague. During that process, the act of following the rules involves impulses travelling along nerve fibres in those parts of the brain associated with higher-order, conscious thought.

Over time, however, the external stimulus provided (say) by the arrival of a pupil or customer becomes more closely associated with a particular type of action – for instance, greeting the other person with the appropriate form of speech – and connections form between the neurons stimulated by that external event and the motor fibres which fire when the teacher or assistant speaks and acts in the requisite fashion. In the case of a more experienced teacher or salesperson, therefore, the neurons that had previously taken the stimulus into the parts of the brain associated with conscious thought need not fire for the appropriate behavioural response to be forthcoming; the impulses passing through the receptor fibres stimulated by the presence of the other person cause the motor neurons associated with the act of issuing the appropriate greeting to fire, without the nerve fibres leading to the higher centres of the brain coming into play. The upshot is that the appropriate action will be taken ‘automatically’, without the involvement of the higher nervous centres, so that the rule will no longer be being followed consciously. The alteration in the neural structures of the brain has led to the formation of a new disposition to greet other people, which causes the person in question to interpret and respond appropriately to that aspect of their social environment without having to make a conscious decision to do so on each separate occasion (Hayek 1952b: 23-25, [1967] 1967: 73-74; cf. Elder-Vass 2007b: 334-37). To use GH’s terminology, the norms of behaviour associated with being an incumbent of a particular role have been internalised.

It is to the internalisation of norms that Hayek is referring when he writes that, ‘[T]he formation of abstractions [dispositions – p. 40] ought to be regarded not as actions of the human mind but rather as something which happens to the mind, or that alters the structure of relationships which we call the mind’ (Hayek [1969] 1978: 43). As GH put it, ‘culture is directly encoded into the human brain’. Or, as Hayek puts it, ‘the brain is an organ enabling us to absorb ... culture’ (1979: 157). For Hayek, social rules can – quite literally - become physically embodied in people’s brains, in the sense that learning how to act in accordance with particular social rules shapes the arrangement of neurons found in people’s brains. And by moulding those neural networks, social rules also shape the dispositions that govern how people perceive, think and act. In short, social rules possess the emergent causal power to shape human agency (Lewis 2012: 374-76).

If we include within the category of ‘dispositions’ people’s preferences – which seems reasonable, because preferences dispose people to behave in certain ways - then what we have in the case of Hayek is an account of the cognitive processes through which people’s preferences

are shaped. '[T]he tastes of man,' Hayek writes, 'as is also true of his opinions and beliefs and indeed much of his personality, are shaped in great measure by his cultural environment' ([1961] 1967: 315) (also see Bowles 1998: 76, 92; and Rodrigues 2013: 566-69). As noted in section 3 above, amongst those preferences are those associated with norms of promise-keeping and truth-telling. In internalising such norms, therefore, people acquire dispositions or preferences to eschew certain forms of opportunistic conduct in favour of adhering to rules that they have come to value intrinsically. In this way, Hayek provides a cognitive psychological foundation for GH's claim that, through a process of socialisation whereby people internalise norms, people acquire 'ethical predispositions ... moral values that induce them to conform to the duties and obligations of the role positions they are expected to occupy'.¹²

Of course, while the formation of the new disposition creates a tendency for people to behave in accordance with social norms, it does not imply that they will invariably do so. Different dispositions – different sets of preferences - may be activated depending on the social context in which people find themselves. Moreover, the impact of one particular disposition on a person's actual behaviour may be offset by the countervailing influence of other dispositions. For example, if a person were driving his/her seriously injured spouse to hospital, then that person's disposition to behave in accordance with the rules of the highway code might be overcome by the countervailing force of his/her desire to save his/her loved one (Hayek 1952b: 23-25, [1969] 1978: 41, 48-49). Hence GH's remark that such normative dispositions 'by no means contradict rationality, because individuals trade off these values against material reward, and against each other'. And it is, of course, the fact that the dispositions inculcated in people by the presence in their society of certain social rules that means that, as noted in the previous section of the paper, bold individuals can at times choose to deviate from the rules that prevail in their society, thereby injecting variety – in the form of new rules - into the process of social evolution.

4.3 Social Preferences, Strong Reciprocity, and Gene-Culture Co-Evolution

While Hayek's theory contains a richer moral economy than is often acknowledged (Rodrigues 2013), the work of the experimental and behavioural economists upon whom GH draw has shown that such behaviour seems far more widespread than Hayek acknowledged. In particular, the evidence reported by GH indicates that the set of people over whom pro-social preferences are defined, and the consequent scope for pro-social behaviour to shape people's interactions, extends beyond the confines of the micro-cosmos or small group of intimate family and friends to which Hayek sometimes seemed to suggest altruism is restricted so as to encompass interactions with comparative strangers with whom they are unlikely to interact more than once but towards whom they feel morally obligated to do the right thing (also see Gintis and Bowles 2014).¹³

¹² See Rodrigues (2013: 571-72, 574) for some interesting examples of how, according to Hayek, the occupants of certain positions – such as judges – are motivated by the kind of moral values emphasised by GH and not merely by appeals to their narrow self-interest.

¹³ For more on this issue, see the essays collected in Garnett *et al.* (2014).

Significantly, evidence indicates that people's pro-social preferences encourage them not only to cooperate with others but also to punish people who violate generally accepted social norms, even when doing so causes the person carrying out the punishment to incur a personal cost. Such behaviour is said to involve people exhibiting *strong reciprocity* or acting as *rule-following punishers* (also see Gintis and Bowles 2014). The kind of altruistic punishment meted out by people who exhibit strong reciprocity is especially important because it suggests how group selection arguments of the kind postulated by Hayek and GH can be defended against critics who contend that they are flawed because altruistic behaviour that benefits the group as a whole, without also benefiting the individual group members who display it, is unsustainable. For instance, Hayek's argument that groups will prosper if their members adhere to social rules that involve them sacrificing their own self-interest for the well-being of the group has been criticised on the grounds that such groups will be undermined by the growing presence of free-riders who benefit from being part of the group without incurring the costs of conforming to the rules in question. While such groups might enjoy a 'between group' advantage in the process of competition with other collections of people, the critics contend that they will ultimately be undermined from the inside because the selfish free-riders will enjoy the benefits of group membership without incurring any of the costs of sustaining it. As a result, they will enjoy a 'within group' advantage over more public-spirited group members, being able to out-compete the latter and eventually coming to dominate the group (Vanberg 1986).

However, the presence of even a small minority of altruistic punishers can help to ensure that it is in the interests of enough people to conform to the rules that characterise the group in question, even though they might not be naturally inclined to do so, thereby deterring free-riding and helping to ensure that the rules sustaining the group's 'between group' advantage continue to be followed. Altruistic punishment of this kind helps to ensure that first-order cooperation – conformity with group-benefitting norms – is more often than not in the individual's own self-interest too. On this view, therefore, altruistic behaviour centres as much if not more on a second-order disposition to enforce the social rules that sustain cooperative group behaviour, and thereby help sustain the emergent causal power upon which group selection rests, than on the first-order disposition to conform to those rules (Wilson 2004: 204-07; Gaus 2006: 242; Gaus and Thrasher 2013: 645, 652-53).

GH also move considerably beyond Hayek in their willingness to explore the genetic processes that facilitate human action and cultural evolution. Hayek notes that social orders are based on two kinds of rule: innate rules, which have been shaped in the process of the biological evolution of the human species and are genetically inherited; and learned rules, which are transmitted culturally. Hayek focuses on the evolution of cultural rules, on the grounds that - because the history of human civilisation has covered only a short period of time compared with that over which man's genetic make-up has evolved - the innate behavioural rules can be taken as given (Hayek 1967: 66; 1973: 23; 1979: 155-6). In contrast, GH consider the impact of genetic as well as cultural evolution, using recent developments in evolutionary biology to

analyse how people came to possess the genetic predisposition for learning culturally-transmitted rules.

GH argue that, if culture is transmitted epigenetically and people are able to internalise norms, then people must have the capability to absorb culture and develop pro-social dispositions or preferences. GH augment their account of cultural evolution with one of genetic evolution, examining how the capacity to absorb culture, etc., is itself the product of an evolutionary process whereby individual people are selected according to how well their genetic capabilities fit them for the cultural or social-structural context they inhabit. The process involved the interaction of genes and culture and is known as gene-culture co-evolution (Boyd and Richerson 1985, 2004). Briefly, the argument is that the kind of societies in which early man lived – basically, hunter-gatherer societies whose sustainability required the cooperation of unrelated people for the purposes of hunting and defence – encouraged the selection of people with the cognitive capacity to internalise pro-social norms, the reason being that such capacities promoted the requisite kind of cooperation. In this way, the human species is biologically adapted to a particular way of life. Of course, the genetic changes produced as people adapt to fit a particular socio-cultural niche subsequently provide the basis for further cultural evolution. On this view, therefore, there is a reciprocal relationship between genetic (biological) and cultural (social-structural) evolution, with biological selection predisposing us for certain kinds of culture which in turn encourage the development of particular biological traits (also see Bowles and Gintis 2014). Overall, then, for GH selection operates along both cultural and genetic dimensions, and at the level of the individual as well as the group. For instance, a new cultural form (such as a new method of farming) could be selected not only because the groups that employ it (are seen to) flourish and are therefore imitated by other groups (cultural group selection) but also because the individuals who engage in the relevant practices do better and so have more offspring (biological selection) (Gaus and Thrasher 2013: 652).

5. EMERGENCE, NOVELTY, UNCERTAINTY, AND CONCEPTIONS OF ORDER

The final section of the essay considers some of the possible the implications of complex systems theory for the degree of uncertainty faced by the inhabitants of complex systems and for the way in which the order exhibited by such systems is best conceptualised.

5.1. Emergent Properties, Novelty and Radical Uncertainty

We move on now to explore the implications for the possibility of rational behaviour of the third property of complex systems noted in Section 2 above, namely that the emergent properties exhibited by such systems are novel in the sense that it is hard, if not impossible, to predict them from our prior knowledge of the elements. Evolutionary economists such as Hodgson (1997, 2000), Dosi *et al.* (2003), Dopfer and Potts (2004, 2009), and Foster and Metcalfe (2012) argue

that emergence arises in the economy when entrepreneurs combine human capital, physical capital, and social rules in novel ways. The properties of these new combinations of goods, knowledge, and rules are emergent in the sense that they are irreducible to the properties of their individual elements: new combinations of capital goods generate emergent capacities that are not possessed by any of the individual components taken in isolation, as for instance when the appropriate assembly of the parts of an iPhone yields a product that has *sui generis* communicative and data-transmitting capabilities (Harper and Endres 2012); while new combinations of the intra-organizational rules that govern production can give rise to new, emergent properties at the level of the firm, such as cheaper production processes and an enhanced capacity to innovate (Potts 2000). Significantly, while these new combinations of capital and rules are composed of familiar elements, the emergent properties to which they give rise typically cannot be deduced from, and so cannot be predicted on the basis of, a prior knowledge of the properties of their individual component parts. The properties are novel in the sense that they are not foreseeable *ex ante*, given people's background knowledge. The occurrence of such 'unknown unknowns' or 'black swans', as they are popularly known, is, therefore, a genuine surprise in the sense that it lies outside the confines of what people had hitherto imagined might happen (Taleb 2008; Runde 2009: 498-01; Harper and Endres 2012).

The existence of unforeseen, emergent features of the world is important because it violates one of the key presuppositions of the theory of rational choice under uncertainty, namely the assumption that people possess from the outset a comprehensive list of all the various possible states of the world that are relevant to their decisions. This assumption, which is variously known as the 'small-world' or 'grand state space' assumption, rules out the possibility of new, previously unimagined events. In doing so, it helps to ensure that the rational actor faces a well-defined decision-problem in which sharp, numerical probabilities can be attached to the consequences of the courses of action open to them (Savage: 1954; Gilboa *et al.* 2012). However, the existence of emergence, and the genuine novelty it introduces into the economic process, makes it impossible for people to specify in advance all the possible states of the world in which they might be called upon to act, and which might shape the consequences of their actions. Emergence is one of the reasons why 'in many decision problems under uncertainty states of the world are neither naturally given nor simply formulated ... often even a comprehensive list of all possible outcomes is not readily available or easily imagined' (Gilboa and Schmeidler 1995: 606).¹⁴ In such cases, decision-makers must deal with radical uncertainty in the Knightian or Keynesian sense of being unable to assign sharp numerical probabilities to the consequences of their actions (Knight 1921; Keynes 1937). Consequently, they cannot act in the expected-utility maximizing fashion postulated by rational decision theory. The corollary is that the standard model is of limited relevance for analysing those situations where people - for example, the managers of high-tech companies in markets characterised by significant levels of

¹⁴ The changes in people's beliefs that arise when hitherto unimagined states of affairs occur cannot be described in terms of Bayesian updating, as the latter precludes the possibility of adding new states or of updating a zero to a positive probability (Dosi *et al.* 2003: 29-30; Feduzi and Runde 2014: 11-12).

innovation - do not inhabit a 'small world' whose structure they know in advance and so have to deal with the possibility of unforeseen events (Shackle [1972] 1992; Gilboa and Schmeidler 1995: 605-08; Dosi *et al.* 2003: 5; Foster and Metcalfe 2012; Gilboa *et al.* 2012: 17; Feduzi and Runde 2014).

While there is a section of GH's essay headed 'Radical uncertainty', they do not appear to countenance the possibility that people may be incapable of assigning numerical probabilities to the consequences of their actions (that is, they do not consider radical uncertainty in the Keynesian or Knightian sense). This is a pity, because it means that they do not address the question of how people can find a way of dealing with such uncertainty and thereby behave in a manner which 'saves [their] faces as rational economic men' (Keynes 1937: 214). Considerations of space preclude a detailed answer to that question here. However, it is worth noting in the context of an essay considering a proposed new analytical core for sociology that recent developments in economic sociology suggest that the answer seems likely to emphasise how people's reliance on social rules and conventions, and their use of power, enables them to narrow down the possible consequences of their actions enough to enable them to act in a purposeful, goal-driven fashion (Lawson 1985, 1987; Beckert 1996; Bibow *et al.* 2005).

4.5 Beyond Equilibrium? Hayek and GH's Conceptions of Order

It is worth reflecting, especially in light of the account just outlined of the market as an open-ended, evolutionary process characterised by the emergence of novelty, on the notions of order to which Hayek subscribes. Over the course of his career, Hayek gradually became less and less convinced of the usefulness of the notion of general equilibrium as a means of capturing the working of the market process. In the 1960s, Hayek explicitly abandoned the notion of equilibrium in favour of the notion of 'order', writing that: 'Economists usually ascribe the order which competition produces as an equilibrium – a somewhat unfortunate term, because such an equilibrium presupposes that the facts have already been discovered and competition has therefore ceased' ([1968] 1978: 184).¹⁵ In its place, Hayek proposes the notion of (social) order, which he defines as 'a state of affairs in which a multiplicity of elements of various kinds are so related to each other that we may learn from our acquaintance with some spatial or temporal part of the whole to form correct expectations concerning the rest, or at least expectations which have a good chance of proving correct' (Hayek 1973: 36). In the case of the market, order manifests itself in the fact that people can usually predict their behaviour of other people well enough to devise plans that have a decent chance of coming to fruition. For Hayek, the advantage that the notion of 'order' has, compared to the concept of equilibrium, is that 'we can meaningfully speak

¹⁵ As GH note, 'The general economic equilibrium model is a static construct that gives no suggestion as to how equilibrium might be attained.' Indeed, the problem is arguably worse than this, because the literature on disequilibrium adjustment processes in general equilibrium models – and, in particular, the so-called Sonnenschein -Mantel- Debreu result - suggests that little progress has been made in providing an account of how general equilibrium can be attained even in those cases where tastes, technologies, etc., remain constant (Fisher 1983; Kirman 1992: 121-23; Miller and Page 2007: 4, 30).

of an order being approved to various degrees, and that order can be preserved throughout a process of change' ([1968] 1978: 184; also see Caldwell 2004: 226-27).

Hayek, then, ultimately rejects the notion of equilibrium because – as sees it – the notion of an end state or equilibrium cannot do justice to the dynamic, open-ended, evolutionary, novelty-generating notion of the market process. In its place, Hayek proposes a *transformational conception of socio-economic order*. To see in a little more detail what this involves, we need to note that for Hayek the continued existence of the inherited stock of social rules that facilitate purposeful, coordinated human agency at any given point in time depends on current human action (Hayek [1967] 1967: 72-80). In drawing upon the set of inherited rules in order to act, people reproduce - or, if individuals transgress and engage in new forms of conduct which others subsequently imitate, transform - those rules. However, so long as there continues to exist a set of rules that generates the emergent causal power to coordinate people's plans, social order – in the sense just defined – will continue to be maintained. On this view, therefore, social order just is the (continual, never-ending) process whereby people draw on (pre-existing, historically given) social rules and norms in order to act and, in doing so, subsequently either reproduce or transform the rules in question (Fleetwood 1995: 135-55; Lewis 2014).¹⁶ And in departing from the notion of equilibrium, Hayek is at one with at least some contemporary complexity theorists, who acknowledge that 'we may need to go beyond equilibria to truly understand the social world' (Miller and Page 2007: 222). In comparison to GH, who retain more of a commitment to the notion of general equilibrium at least as a baseline concept, albeit one has to be augmented by an analysis of disequilibrium adjustment processes, Hayek makes a more radical break with the notion of equilibrium, whilst still being able to explain how order is maintained through an evolutionary process of change.

5. CONCLUSION

The account provided above has sought to bring out the way in which GH's proposed analytical framework for sociology embodies something like a complexity approach. It exhibits, and sets considerable store by, at least four important features of complex systems: the importance of the relations that obtain between the system's parts; the way in which such systems exhibit emergent properties; their adaptive/evolutionary nature; and, though perhaps less fully than (say) Hayek's approach, the way in which the development of complex systems can generate novelty.

GH's treatment of the economy as a complex system underwrites several (inter-related) features of their work that differentiate it from much economic analysis and which are likely to enhance its appeals to sociologists. Perhaps most prominently, these features include: GH's treatment of people as socially embedded beings whose dispositions are shaped by the social

¹⁶ Hence Hayek's remarks that, 'The same overall order of actions may be produced by different sets of rules of individual conduct' ([1967] 1967: 68) and, 'The coherent structures in which we are mainly interested are those in which a complex pattern has produced properties which make self-maintaining the structure showing it' ([1964] 1967: 27).

context in which they act; their portrayal of people as being driven by a variety of motivations, at least some of which transcend the self-interested behaviour normally emphasised by economists; and their account of society as developing via a multi-level evolutionary process involving both genetic and not only by genetic and develop by socio-cultural factors.

Of course, there are many different ways both of conceptualising complex systems and also of analysing their properties and behaviour (Sawyer 2005; Holt *et al.* 2011; Page 2011: 24-33). A comparison with Hayek's work on complex systems highlights two notable, and related, issues where GH's particular approach might still cause concern for sociologists. Both issues concern the way in which, from the vantage point provided by the Hayekian version of complexity theory, the economy appears to develop via an open-ended, evolutionary process which is punctuated by the emergence of novel technologies, products, and ways of working. Such features of the economic system imply that at times people must act in the face of radical uncertainty of a kind to which the standard theory of choice under uncertainty espoused by GH cannot do justice. They also raise the question of whether an alternative to the notion of general equilibrium is required to do justice to the kind of social order exhibited in such systems.

REFERENCES

Beckert, Jens. 1996. "What is Sociological about Economic Sociology? Uncertainty and the Embeddedness of Economic Action," *Theory and Society* 25, no. 6: 803–840. DOI: 10.1007/BF00159817.

Bibow, Jörg, Paul Lewis and Jochen Runde. 2005. "Uncertainty, Conventional Behaviour and Economic Sociology," *American Journal of Economics and Sociology* 64, no. 2: 507-32. DOI: 10.1111/j.1536-7150.2005.00377.x.

Bowles, Samuel. 1998. "Endogenous Preferences: The Cultural Consequences of Markets and other Economic Institutions," *Journal of Economic Literature* 36, no. 1: 75-111.

Boyd, Robert and Peter Richerson. 1985. *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.

Boyd, Robert and Peter Richerson. 2004. *The Nature of Cultures*. Chicago: University of Chicago Press.

Caldwell, Bruce. 2004. *Hayek's Challenge: An Intellectual Biography of F.A. Hayek*. Chicago and London: The University of Chicago Press.

Dopfer, Kurt and Jason Potts. 2004. "Evolutionary Foundations of Economics." In *Evolution and Economic Complexity*, Stanley Metcalfe and John Foster. Cheltenham: Edward Elgar.

Dopfer, Kurt and Jason Potts. 2008. *The General Theory of Economic Evolution*. London and New York: Routledge.

Dosi, Giovanni, Luke Marengo and Giorgio Fagiolo. 2003. "Learning in Evolutionary Environments," LEM Working paper. 2003/20. Available online at: <http://www.lem.sssup.it/WPLem/files/2003-20.pdf>. Accessed 27th February 2014.

Elder-Vass, David. 2007a. "For Emergence: Refining Archer's Account of Social Structure," *Journal for the Theory of Social Behaviour* 37, no. 1: 25-44. DOI: 10.1111/j.1468-5914.2007.00325.x.

Elder-Vass, David. 2007b. "Reconciling Archer and Bourdieu in an Emergentist Theory of Action," *Sociological Theory* 25, no. 4: 325-46. DOI: 10.1111/j.1467-9558.2007.00312.x.

Emirbayer, Mustafa. 1997. "Manifesto for a Relational Sociology," *American Journal of Sociology* 103, no. 2: 281-317. DOI: 10.1086/231209.

Etzioni, Amitai. 1988. *The Moral Dimension*. New York: The Free Press.

Feduzi, Alberto and Jochen Runde. 2014. "Uncovering Unknown Unknowns: Towards a Baconian Approach to Management Decision-Making," *Organizational Behavior and Human Decision Processes*. DOI: 10.1016/j.obhdp.2014.04.001.

Fisher, Franklin. 1983. *Disequilibrium Foundations of Equilibrium Economics*. Cambridge: Cambridge University Press.

Fleetwood, Steve. 1995. *Hayek's Political Economy: The Socio-Economics of Order*. London New York: Routledge.

Foster, John and Stanley Metcalfe. 2012. "Economic Emergence: An Evolutionary Perspective," *Journal of Economic Behavior and Organization* 82, no. 2-3: 420-32. DOI:[org/10.1016/j.jebo.2011.09.008](http://dx.doi.org/10.1016/j.jebo.2011.09.008).

Gaus, Gerald. 2006. "Hayek on the Evolution of Society and Mind." In *The Cambridge Companion to Hayek*, edited by Edward Feser. Cambridge: Cambridge University Press.

Gaus, Gerald. 2012. "Evolution, Altruism and our Cooperative Social Order." In *Morality: The Why and the What of it*, edited by James Sterba. Boulder, CO: Westview Press.

Gaus, Gerald. and John Thrasher. 2013. "Social Evolution." In *The Routledge Companion to Social and Political Philosophy*, edited by Gerald Gaus and Fred D'Agostino. London and New York: Routledge.

Gilboa, Itzhak and David Schmeidler. 1995. "Case-Based Decision Theory," *Quarterly Journal of Economics* 110, no. 3: 605-39. DOI:10.2307/2946694.

Gilboa, Itzhak, Andrew Postlewaite and David Schmeidler. 2012. "Rationality of Belief or: Why Savage's Axioms are neither Necessary nor Sufficient for Rationality," *Synthese*, 187, no. 1: 11-31. DOI: 10.1007/s11229-011-0034-2.

Gintis, Herbert and Samuel Bowles. 2014. "The Evolution of Human Cooperation." In *Commerce and Community: Human Flourishing through Voluntary Action*, edited by Robert Garnett, Paul Lewis and Lenore Ealy. London and New York: Routledge.

Granovetter, Mark. 1985. "Economic Action and Social Structure: The Problem of Embeddedness," *American Journal of Sociology* 91, no. 3: 481-510. Stable URL: <http://www.jstor.org/stable/2780199>.

Harper, David and Anthony Endres. 2012. "The Anatomy of Emergence, with a Focus upon Capital Formation," *Journal of Economic Behavior and Organization* 82, no. 2-3: 352-67. DOI:[10.1016/j.jebo.2011.03.013](https://doi.org/10.1016/j.jebo.2011.03.013).

Hayek, Friedrich. [1944] 2007. *The Road to Serfdom. Text and Documents: The Definitive Edition*. Edited by Bruce Caldwell. Chicago: The University of Chicago Press.

Hayek, Friedrich. 1952a. *The Counter-Revolution of Science: Studies in the Abuse of Reason*. Indianapolis: Liberty Fund.

Hayek, Friedrich. 1952b. *The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology*. London and Henley: Routledge & Kegan Paul.

Hayek, Friedrich. 1960. *The Constitution of Liberty*. London and New York: Routledge.

Hayek, Friedrich. [1961] 1967. "The Non-Sequitur of the 'Dependence Effect'." In *Studies in Philosophy, Politics and Economics*, by Friedrich Hayek. London: Routledge & Kegan Paul.

Hayek, Friedrich. [1964] 1967. "The Theory of Complex Phenomena." In *Studies in Philosophy, Politics and Economics*, by Friedrich Hayek. London: Routledge & Kegan Paul.

Hayek, Friedrich. [1967] 1967. "Notes on the Evolution of Systems of Rules of Conduct." In *Studies in Philosophy, Politics and Economics*, by Friedrich Hayek. London: Routledge & Kegan Paul.

Hayek, Friedrich. [1968] 1978. "Competition as a Discovery Procedure." In *New Studies in Philosophy, Politics, Economics and the History of Ideas*, by Friedrich Hayek. London and Henley: Routledge & Kegan Paul.

Hayek, Friedrich. [1969] 1978. "The Primacy of the Abstract." In *New Studies in Philosophy, Politics, Economics and the History of Ideas*, by Friedrich Hayek. London and Henley: Routledge & Kegan Paul.

Hayek, Friedrich. 1973. *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume I: Rules and Order*. London and New York: Routledge.

Hayek, Friedrich. 1976. *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume II: The Mirage of Social Justice*. London and New York: Routledge.

Hayek, Friedrich. 1979. *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume III: The Political Order of a Free People*. London and New York: Routledge." *The Essence of Hayek*, edited by Chiaki Nishiyama and Kurt Leube. Stanford: Hoover Institution Press.

Hayek, Friedrich. 1988. *The Fatal Conceit: The Errors of Socialism*. Edited by Warren Bartley III. London: Routledge.

Hodgson, Geoffrey. 1997. "Economics and the Return to Mecca: The Recognition of Novelty and Emergence." *Structural Change and Economic Dynamics* 8, no. 4: 399-412. [http://dx.doi.org/10.1016/S0954-349X\(96\)00073-2](http://dx.doi.org/10.1016/S0954-349X(96)00073-2).

Hodgson, Geoffrey. 2000. "From Micro to Macro: The Concept of Emergence and the Role of Institutions." In *Institutions and the Role of the State*, edited by Leonardo Burlamaqui, Ana Castro, and Ha-Joon Chang. Cheltenham: Edward Elgar.

Holt, Richard, J. Barkley Rosser, Jr., and David Colander. 2011. "The Complexity Era in Economics," *Review of Political Economy* 23, no. 3: 357-69. 10.1080/09538259.2011.583820

Jepperson, Ronald and John Meyer. 2011. "Multiple Levels of Analysis and the Limitations of Methodological Individualisms," *Sociological Theory* 29, no. 1: 54-73. DOI: 10.1111/j.1467-9558.2010.01387.x

Keynes, John Maynard. 1937. "The General Theory of Employment," *Quarterly Journal of Economics* 51, no. 2: 209-223. doi:10.2307/1882087.

Kirman, Alan. 1992. "Whom or What does the Representative Agent Represent?" *Journal of Economic Perspectives* 6, no. 2: 117-37. DOI: 10.1257/jep.6.2.117.

Knight, Frank. 1921. *Risk, Uncertainty, and Profit*. Boston and New York: Kelley.

Lawson, Tony. 1985. "Uncertainty and Economic Analysis," *Economic Journal* 95, no. 380: 909-27. DOI: 10.2307/2233256

Lawson, Tony. 1987. "The Relative/Absolute Nature of Knowledge and Economic Analysis," *Economic Journal* 97, no. 388: 951-70. DOI: 10.2307/2233082

Lawson, Tony. 2012. "Ontology and the Study of Social Reality: Emergence, Organisation, Community, Power, Social Relations, Corporations, Artefacts and Money," *Cambridge Journal of Economics* 36, no. 2: 345-85. doi:10.1093/cje/ber050.

Lewis, Paul. 2011. "Far from a Nihilistic Crowd: Lavoie and Lachmann's Theoretical Contribution," *Review of Austrian Economics* 24, no. 2: 185-98. DOI: 10.1007/s11138-011-0143-7.

Lewis, Paul. 2012. 'Emergent Properties in the Work of Friedrich Hayek.' *Journal of Economic Behavior and Organisation*, 82, no. 2-3: 368-78. [DOI.org/10.1016/j.jebo.2011.04.009](https://doi.org/10.1016/j.jebo.2011.04.009).

Lewis, Paul. 2013. Hayek, Social Theory, and the Contrastive Explanation of Socio-Economic Order," *Critical Review* 25, 3-4: 386-408. DOI:10.1080/08913811.2013.853858.

Lewis, Paul. 2014. 'Notions of Order and Process in Hayek: The Significance of Emergence.' Forthcoming in the *Cambridge Journal of Economics*.

McQuade, Thomas and William Buto. 2005. “*The Sensory Order* and other Adaptive Classifying Systems,” *Journal of Bioeconomics* 7, no. 3: 335-58. DOI: 10.1007/s10818-005-7606-5.

Miller, John and Scott Page. 2007. *Complex Adaptive Systems*. Princeton and Oxford: Princeton University Press.

Ostrom, Elinor. 1990. *Governing the Common: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Page, Scott. 2011. *Diversity and Complexity*. Princeton and Oxford: Princeton University Press.

Potts, Jason. 2000. *The New Evolutionary Microeconomics: Complexity, Competence, and Adaptive Behaviour*. Cheltenham: Edward Elgar.

Rodrigues, João. 2013. “Between Rules and Incentives: Uncovering Hayek’s Moral Economy,” *American Journal of Economics and Sociology*, 72, no. 3: 565-92. DOI: 10.1111/ajes.12018.

Runde, Jochen. 2009. “Dissecting the Black Swan,” *Critical Review* 21, no. 4: 491-505. DOI:10.1080/08913810903441427.

Sawyer, R. Keith. 2002. “Durkheim’s Dilemma: Toward a Sociology of Emergence,” *Sociological Theory* 20, no. 3: 227-47. DOI: 10.1111/1467-9558.00160.

Sawyer, R. Keith. 2005. *Social Emergence: Societies as Complex Adaptive Systems*. Cambridge: Cambridge University Press.

Savage, Leonard. 1954. *The Foundations of Statistics*. London: John Wiley & Sons.

Shackle, George. [1972] 1992. *Epistemics and Economics: A Critique of Economic Doctrines*. New Brunswick and London: Transaction Publishers.

Taleb, Nassim Nicholas. 2008. *The Black Swan: The Impact of the Highly Improbable*. London: Penguin.

Vanberg, Viktor. 1986. “Spontaneous Market Order and Social Rules: A Critical Examination of F.A. Hayek’s Theory of Cultural Evolution,” *Economics and Philosophy* 2, no. 1: 75-100. DOI: <http://dx.doi.org/10.1017/S0266267100000808>.

Wilson, David Sloan. 2004). “The New Fable of the Bees: Multilevel Selection, Adaptive Societies, and the Concept of Self-Interest,” *Advances in Austrian Economics* 7: 201-20. DOI: [10.1016/S1529-2134\(04\)07009-7](https://doi.org/10.1016/S1529-2134(04)07009-7).